

A Record of *Sinoxylon anale* Lesne in Ukraine with Notes on False Powder-Post Beetles (Coleoptera: Bostrichidae) and their Chalcidoid Parasitoids (Hymenoptera)

A. V. Gumovsky

I. I. Schmalhausen Institute of Zoology
Bogdan Chmielnicki St. 15,
01601 Kiev-30, Ukraine

E-mail: gumovsky@izan.kiev.ua, entedon@gmail.com

Gumovsky A. V. A record of *Sinoxylon anale* Lesne in Ukraine with notes on false powder-post beetles (Coleoptera: Bostrichidae) and their chalcidoid parasitoids (Hymenoptera). Summary. A quarantine bostrichid beetle *Sinoxylon anale* Lesne was reared in Ukraine from wood pallets imported from India. The species damaged the imported wood, but likely cannot survive under natural conditions in Ukraine because of inappropriate climatic conditions and lack of host plants in the region. Diagnostic characters of *S. anale* as well as characteristic damage caused by the *Sinoxylon* beetles in warehouses and in nature (West Africa) are discussed and illustrated. An annotated list of 6 known chalcidoid parasitoids (Hymenoptera: Chalcidoidea) of bostrichid beetles is given. It is suggested that all these records require a confirmation due to the lack of biological observations. In Europe, only *Entedon stephanopachi* Hedqvist (Eulophidae) is expected to be a bostrichid specialist rather than an associate of another xylophagous beetles.

Key words: Coleoptera: Bostrichidae, *Sinoxylon anale*, Chalcidoidea, parasitoids, Ukraine, Africa.

Гумовський А. В. Находка *Sinoxylon anale* Lesne в Україні з замечаниями о жуках-капюшонниках (Coleoptera: Bostrichidae) и их хальцидоидных паразитоидах (Hymenoptera). Резюме. Карантинный вредитель древесины жук-капюшонник *Sinoxylon anale* Lesne (Bostrichidae) выведен в Украине из древесины упаковочных палетт, привезенных из Индии. Данный вид может повреждать упаковочный привозной древесный материал, однако, вероятно, не способен существовать длительное время в естественной среде в Украине из-за неподходящих климатических условий и отсутствия необходимых кормовых растений. В статье обсуждены и проиллюстрированы диагностические признаки *S. anale*, а также характерные повреждения, вызываемые жуками рода *Sinoxylon* в хранилищах и в природных условиях Западной Африки. В работе приведен аннотированный список 6 известных хальцидоидных наездников (Hymenoptera: Chalcidoidea), паразитирующих в жуках-капюшонниках. Все имеющиеся сведения о паразитизме хальцид на капюшонниках требуют подтверждения из-за отсутствия собственно биологических наблюдений. В Европе только для *Entedon stephanopachi* Hedqvist (семейство Eulophidae) можно предположить обоснованность связи с жуками-капюшонниками, в то время как для других видов скорее можно предположить связь с другими жуками-ксилофагами.

Ключевые слова: Coleoptera: Bostrichidae, *Sinoxylon anale*, Chalcidoidea, паразитоиды, Украина, Африка.

Гумовський О. В. Знахідка *Sinoxylon anale* Lesne в Україні із зауваженнями про жуків-каптурників (Coleoptera: Bostrichidae) та їхніх хальцидоїдних паразитоїдів (Hymenoptera). Резюме. Карантинний шкідник деревини жук-каптурник *Sinoxylon anale* Lesne (Bostrichidae) виведений в Україні з деревини пакувальних палет, привезених з Індії. Цей вид ушкоджує завезений деревний пакувальний матеріал, проте, ймовірно, не здатний існувати тривалий час в природному середовищі в Україні через непридатні кліматичні умови та відсутність необхідних кормових рослин. У статті обговорені та проілюстровані діагностичні ознаки *S. anale*, а також характерні ушкодження, що спричиняються жуками роду *Sinoxylon* у сховищах та в природних умовах Західної Африки. У роботі наведено анотований список 6 відомих хальцидоїдних їздців (Hymenoptera: Chalcidoidea), що паразитують у жуках-каптурниках. Усі наявні відомості про паразитизм хальцид на каптурниках вимагають підтвердження через відсутність власне біологічних спостережень. У Європі тільки для *Entedon stephanopachi* Hedqvist (родина Eulophidae) можна припустити обґрунтованість зв'язку з жуками-каптурниками, тоді як для інших видів ймовірнішим є зв'язок з іншими жуками-ксилофагами.

Ключові слова: Coleoptera: Bostrichidae, *Sinoxylon anale*, Chalcidoidea, паразитоїди, Україна, Африка.

Introduction

The false powder-post beetles or auger beetles of the family Bostrichidae, represent one of the families of xylophagous beetles, a group of insects comprising many forestry and stored product pests (Liu, Beaver & Yang, 2006; Liu, Schönitzer & Yang, 2008). The powder-post beetles of the genus *Sinoxylon* Duftschmid are often found in wooden packages and their presence is generally discernible by the powder-like frass (Fig. 1A, B) expelled by beetles and their larvae burrowing into timber (Fig. 1D). The false powder-post beetle, *Sinoxylon anale*, is considered one of the most destructive wood borers in India, attacking great variety of plants (Fisher, 1950). *S. anale* is regarded as a quarantine pest in many tropical and subtropical countries (Teixeira, Novo & Berti Filho, 2002); it is also mentioned

in quarantine lists supplementing international trade agreements in Ukraine.

Facing the necessity of improvement of biocontrol approaches against wood-boring beetles, including the false powder-post beetles, a research project on their biology was started. In the beginning of July 2007 *Sinoxylon anale* Lesne was registered in Ukraine. Further infestation of *Sinoxylon* species was studied by the author in countries of East and West Africa. Here we report some preliminary results of this project.

Material is deposited in the collection of I. I. Schmalhausen Institute of Zoology, National Academy of Sciences of Ukraine (Kiev).

***Sinoxylon anale* Lesne, 1897 (Fig. 1)**

Material. Ukraine, Kiev, reared from wood pallets imported from India, 10–12.07.2007, 12 ♂, 25 ♀ (Gumovsky).

disc increasing in size posteriorly, very coarse at upper margin of declivity, disc angularly separated from declivity.

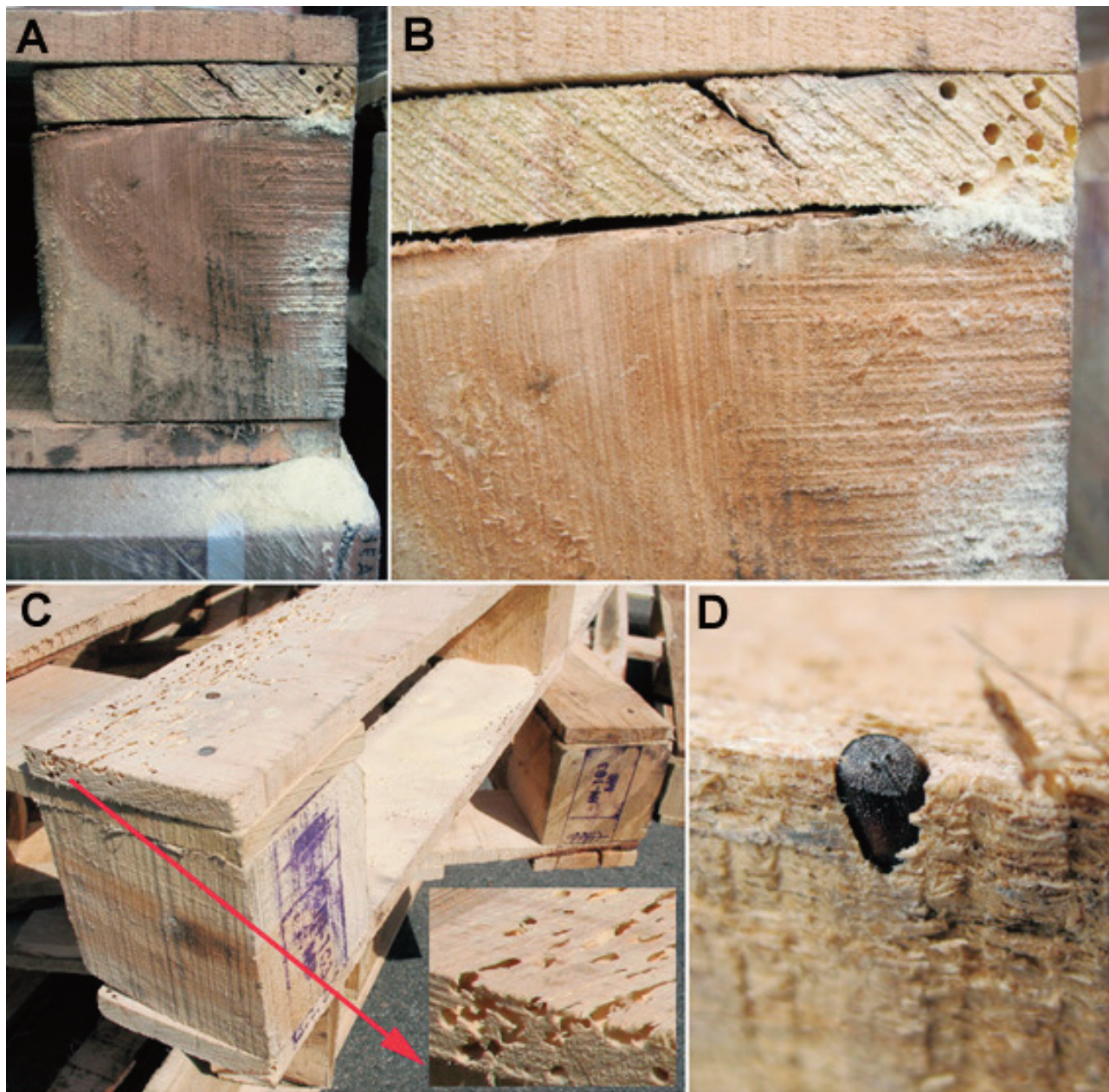


Fig. 1. Damage of wooden pallets caused by *Sinoxylon anale* (Kiev warehouse, July, 2007): A-C — damaged palette (B — close-up of A), D — posterior end (elytral declivity with two protruding spines) of the beetle, which burrows into timber.

Diagnostic characters (Fig. 2). Body 3.5–6.0 mm; frons 4-toothed; elytra with protruding upwards spines at posterior end; apical declivity bearing sparse pubescence consisted of recurved hairs, and limited dorsally by thick carina; each elytron bearing sharply elevated posteriorly submarginal carina along its lateral margin, the carina forming lower margin of elytral declivity. Punctures of elytral

Base of each elytron with a sharp carina between the shoulders and the scutellum; intercoxal projection narrow, parallel-sided; sutural pad with margins toothed or notched. Segments of antennal club fan-shaped, with widely separated sensory pores, first segment about five times as wide as long, the second segment wider than the overall length of club.

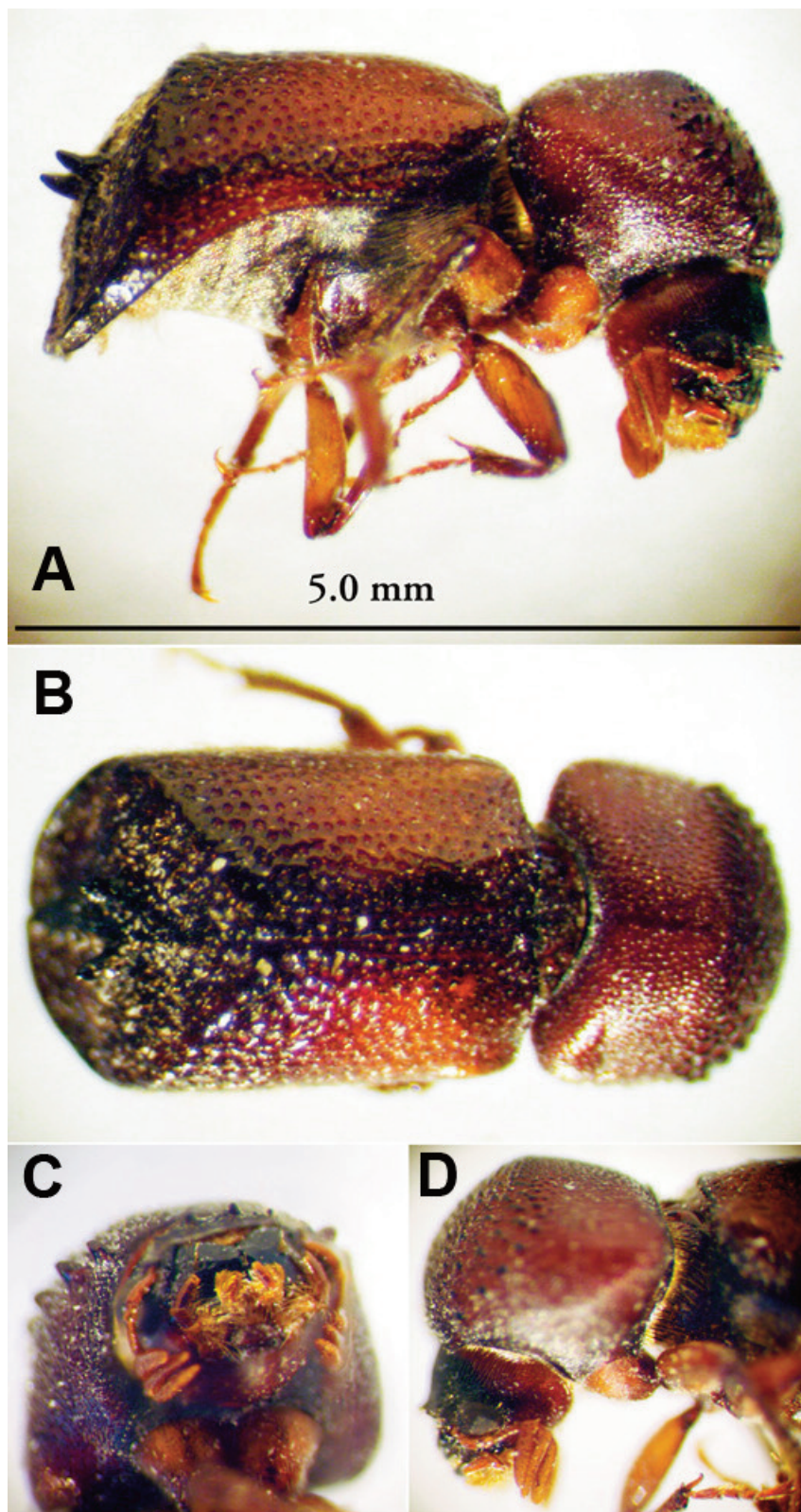


Fig. 2. *Sinoxylon anale* (specimen from mines in wooden palettes imported from India, Kiev warehouse): A — lateral view, B — dorsal view, C — head in frontal view, D — head and pronotum in lateral view.

This species may be occasionally confused with *S. conigerum* Gerstaecker if the submarginal carina along lateral margin of elytron is not quite sharp. However, these two species may be distinguished by the crenulations along the inner elytral margins in the elytral declivity in *S. anale*

Biological remarks.

Bostrichid beetles are often called powder beetles (or false powder beetles) because of their easily recognizable fine, powder-like frass exerted from tunnels (Figs. 1, 3). Wood-damaging Bostrichidae of the genus *Sinoxylon* are commonly found in tropical areas, especially arid, where they damage wide range of trees (Bushara, 1981). For example, all dried logs of *Acacia radiana* in the Dias area (East Senegal) were heavily damaged by *Sinoxylon senegalense*, despite that the logging was done relatively recently (Fig. 3).

S. anale was described from India (Lesne, 1906), and since then it was found in several areas of the Oriental, Australasian, Nearctic and Neotropical and South-West of Palaearctic Regions (Teixeira, Novo & Berti Filho, 2002). It was registered in various parts of the world due to trading activities: e. g. USA (Lesne, 1906; Fisher, 1950), Poland (Sliwa, 1971; Skalski, 1971), Venezuela (Joly, Dedordy & Moreira, 1994), Brazil (Teixeira, Novo & Berti Filho, 2002), Australia (Walker, 2007) etc. In India, *S. anale* was recorded as a common associate of over 60 plant species in forests, timber depots, sawmills, furniture and packing cases (Bee-son, Bhatia, 1937; Fisher, 1950). In other regions this false powder beetle was recorded to damage rosewoods (*Dalbergia latifolia*, *D. sissao*), sal tree (*Shorea robusta*), bibhitaka (*Terminalia belerica*), laupata (*Mallotus roxburghianus*), horse gram (*Macrotyloma uniflorum*), hyacinth bean (*Lablab pur-*

pureus), flamboyant (*Delonix regia*), rubber tree (*Hevea brasiliensis*), cashew (*Anacardium occidentale*), umbrella thorn (*Acacia tortilis*), other acacia trees (*A. mangium*, *A. auriculiformis*), kampak (*Koompassia melaccensis*), wild tamarinds (*Leucaena diversifolia*, *L. leucocephala*), and

survive outdoors, what is likely explained by inappropriate climatic conditions and lack of suitable host plants in the region (Sliwa, 1971; Skalski, 1971). Therefore, occasional introductions of this species may hardly cause significant economical impact in Ukraine.

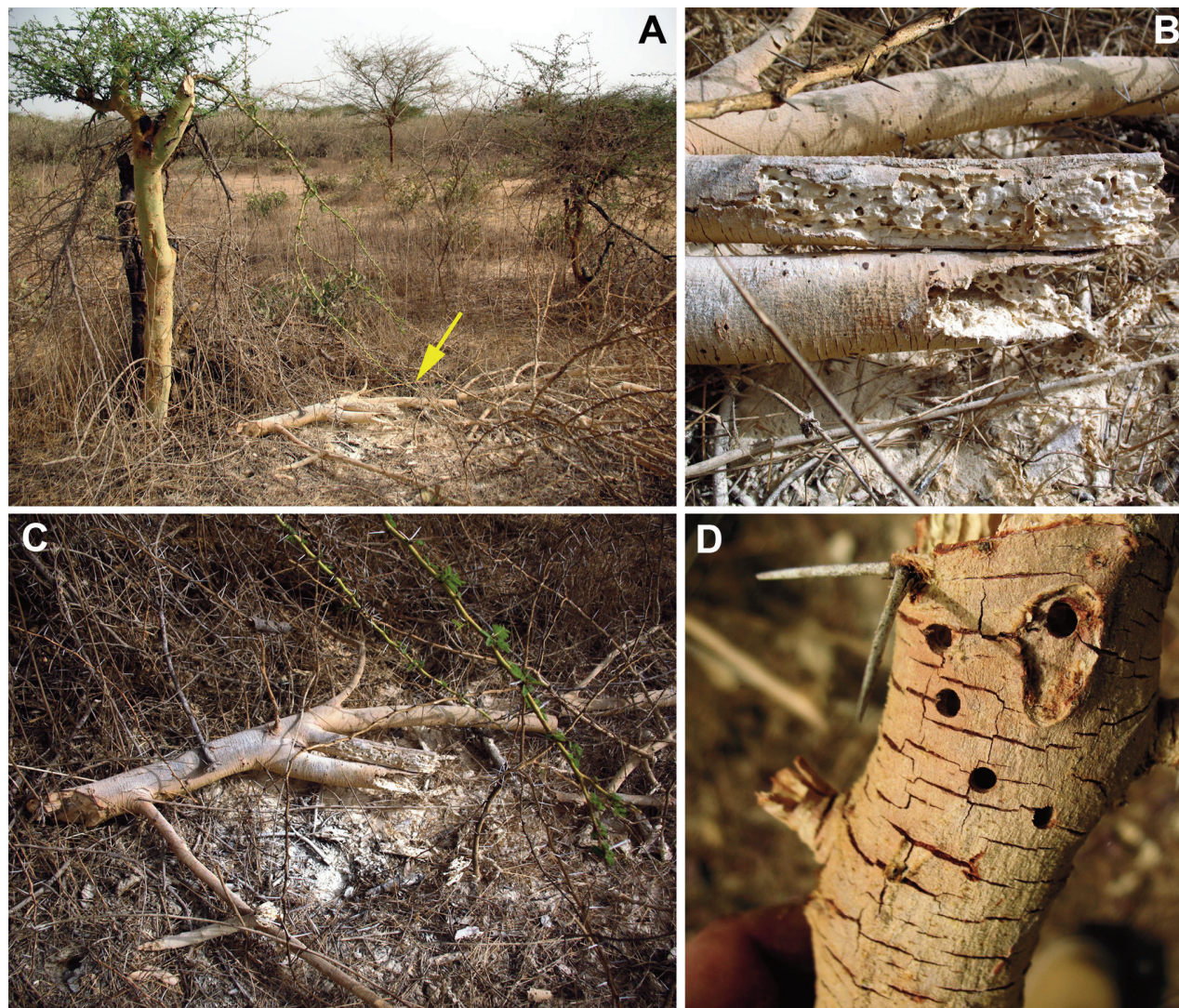


Fig. 3. Damage of dead dry *Acacia radiana* wood caused by *Sinoxylon senegalense* (Senegal, Foret de N'Diassé, Mbourouk: April, 2008): A, a savannah with Acacia trees and one cut dead dried branch (arrowed and enlarged in B and C), surrounded by a characteristic whitish powder-like frass, which suggests an infestation by *Synoxylon* beetles; D, a close-up of a damaged branch with emergence holes of beetles.

many others (Lesne, 1906; Joly, Dedordy & Moreira, 1994; Gnanaharan, Mathew & Damodharan, 1983; Gnanaharan, Sudheendrakumar & Nair, 1985; Pratap & Bhandari, 1987).

In tropical countries *S. anale* occurs in natural conditions: in Malaysia it was recorded in field in rubber wood (Ho & Hashim, 1997), in Israel it occurred on flamboyant (Argaman, 1987). However, in Europe *S. anale* does not

Chalcidoid parasitoids of Bostrichidae

Although wood-boring beetles constitute a suitable resource for many chalcidoid parasitoids (Noyes, 2003), just 6 species are recorded as the parasitoids of the bostrichid beetles. An annotated list is provided below.

Family Chalcididae

Tanycoryphus conglobatus Steffan, 1950

Host records. Bostrichidae: *Apate* sp. (Bouček, 1958).

Distribution. Madagascar (Steffan, 1950; Bouček, 1958).

Notes. The only available host record not supported by biological observations poorly supports an association of this species with Bostrichidae.

Tanycoryphus criniger Steffan, 1950

Host records. Bostrichidae: *Apate* sp. (Herting, 1973).

Distribution. Mozambique, South Africa, Zimbabwe (Steffan, 1950; Bouček, 1958).

Family Pteromalidae

Cheiopachus quadrum (Fabricius, 1787)

Host records. This species is mostly recorded as an associate of xylophagous curculionids (*Magdalis* spp.) and bark beetles (Scolytinae) of the genera *Scolytus*, *Ips*, *Hylesinus*, *Dryocoetes*, *Phloeosinus* and others (summarized in Noyes, 2003). The only recorded bostrichid hosts are *Apate* sp. and *Sinoxylon sexdentatum* (Olivier) (Thompson, 1958).

Distribution. Holarctic and Oriental Regions (records are summarized in: Noyes, 2003).

Notes. The available only records of bostrichid hosts are given in a general review (Thompson, 1958) and not supported by biological observations.

Cerocephala aquila (Girault, 1920)

Host records. Coleoptera, Bostrichidae: *Dinoderus* sp. (Bouček, 1988), *Dinoderus minutus* (Fabricius) (Baltazar, 1966; De Santis, 1979; Herting, 1973; Anonymous, 1975), *Xylothrips religiosus* (Boisduval) (Herting, 1973); Coleoptera, Lyctidae: *Minthea rugicollis* (Walker) (Herting, 1973).

Distribution. Australia (Baltazar, 1966; Bouček, 1988; Ghosal, 2007; Girault, 1920; 1932), China (Huang, Xiao, 2005), Cuba (Baltazar, 1966; Bouček, 1988; De Santis, 1979; Herting, 1973); Fiji (Baltazar, 1966; Bouček, 1988; Herting, 1973); Hawaii (Anonymous, 1975), Japan (Ishii, 1956), Mexico (Baltazar, 1966; Bouček, 1988; De Santis, 1979; Herting, 1973), Philippines (Baltazar, 1966; Bouček, 1988; Herting, 1973), Puerto Rico (De Santis, 1979; Herting, 1973).

Notes. The available only records of bostrichid hosts are given in a general review (Herting, 1973) and not supported by biological observations.

Family Eurytomidae

Endobia donacis Erdős, 1964

Host records. Coleoptera, Bostrichidae: *Dinoderus* sp. (Farooqi & Subba Rao, 1986); Hymenoptera, Eurytomidae: *Tetramesa romana* Walker (Gates & Smith, 2007).

Distribution. France (Erdős, 1964), India, Myanmar, Thailand (Farooqi & Subba Rao, 1986; Mani et al., 1974), USA (Gates & Smith, 2007).

Remark. The species was supposed to be an associate of a bostrichid *Dinoderus* sp. by Farooqi & Subba Rao (1986). However, Gates & Smith (2007) suggested that this species is rather a parasitoid of *Tetramesa romana* in stems of *Arundo donax* (Poaceae) based on field observations. So, biological observations are necessary for the clarification of host associations in bostrichid parasitoids mentioned in this putative list.

Family Eulophidae

Entedon stephanopachi Hedqvist, 1959 (Fig. 4)

Host records. Coleoptera, Bostrichidae: *Stephanopachys* sp. (Hedqvist, 1959; Bouček & Askew, 1968; Schauff, 1988; Askew, 1991), *Stephanopachys rugosus* (Olivier), *Stephanopachys substriatus* (Paykull) (Schauff, 1988); Curculionidae: Scolytidae: *Dendroctonus ponderosae* Hopkins (Schauff, 1988).

Distribution. Europe (Bouček & Askew, 1968; Schauff, 1988; Askew, 1991; Hedqvist, 2003), USA (Schauff, 1988).

Notes. This species is most reliably a bostrichid parasitoid because records of its association with Bostrichidae prevail the other host records. However, biological observations are needed to support these records and avoid possible confusion with other xylophagous hosts. This species is morphologically similar to *E. methion* Waker, another congeneric associate of xylophagous beetles from which it differs in the possession of while longitudinal stripes on fore tibiae and widely pale mid and hind tibiae (Fig. 4). However, although stable in many species, the presence of the pale stripes on fore tibiae were recorded as variable for *E. sylvestris* Szelenyi (Askew, 1992; Gumovsky, 2006). This emphasizes the importance of further studies expected to shed light on the status of *E. stephanopachi*.

Discussion

The false powder-post beetle *Sinoxylon anale* recorded in Ukraine is a representative of a worldwide distributed family containing many wood pests. Chalcidoid wasps (Hymenoptera, Chalcidoidea) are a perspective group of biocontrol agents against these beetles, however just six species are recorded as associated with bostrichids. There are no biological observations on chalcidoid parasitoids of Bostrichidae, and therefore even the records themselves are somehow doubtful. Among listed parasitoids just two species (*Cheiopachus quadrum* and *Entedon stephanopachi*) are of true European distribution and only *E. stephanopachi* is believed to be a bostrichid specialist rather than an associate of wide range of xylophagous beetles (contrary to *C. quadrum*). Further studies are needed for adequate estimation of the species richness of parasitoids attacking the false powder-post beetles.

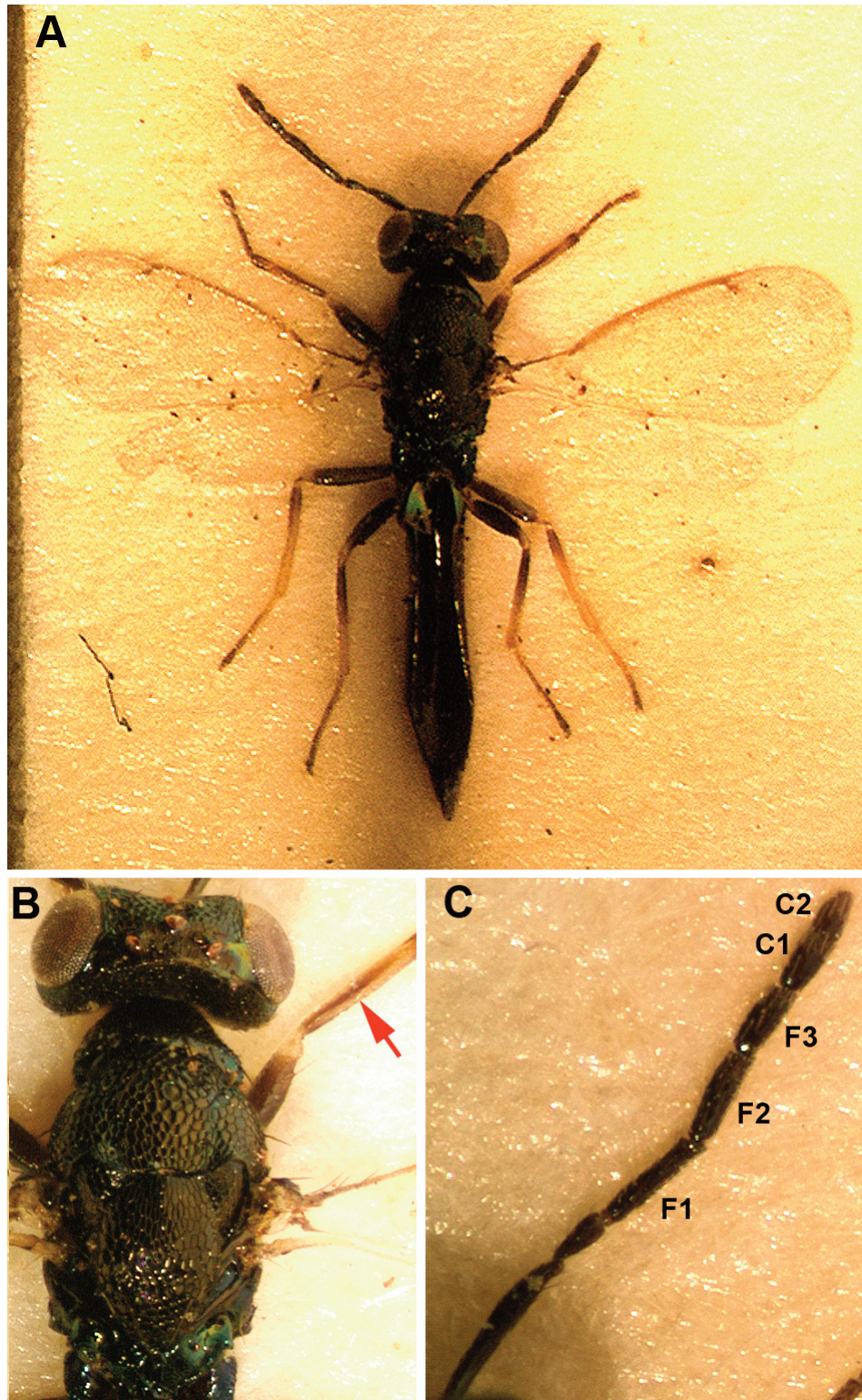


Fig. 4. *Entedon stephanopachi* Heqvist, 1959, a parasitoid of a bostrichid *Stephanopachys* sp.: holotype, the Swedish Museum of Natural History (Naturhistoriska Riksmuseet), Stockholm, Sweden: A, habitus in dorsal view; B, head and mesosoma enlarged; C, antenna (F1–3, funicular segments; C1–2, claval segments).

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